WHAT A WEATHER OBSERVER SHOULD KNOW.

By N. R. TAYLOR, Observer Weather Bureau.

What must one know in order to become an observer in the United States Weather Bureau is a question that perhaps every man in this service has been called upon to answer times without number and if this article will give an adequate reply to the query, the writer will feel that his labor has not been thrown away.

The Civil Service Commission will also answer the question from their standpoint and tell the would-be weather prophet that in addition to a fair knowledge of the three "R's" he must know something of physics, geography, history, etc., and a great deal of meteorology, in order to secure their diploma of eligibility, but they can not tell, if their graduate is fortunate enough to receive his appointment, whether or not he will be a success.

A Weather Bureau man serving on station, whether he ranks as local forecast official, section director, observer, or revels in the three combined, to be a credit to the service, must be a man of education and training, and in addition to being, like Benjamin Franklin, a "philosopher, philanthropist and printer," should be a statistician, a geologist and a farmer; he must be able to prophesy of weather events to come and keep an accurate and comprehensive record of those past. He should be an electrician too; and an astronomer, unaided by any stargazing paraphernalia with which to sweep the heavens for lost comets.

That a weather observer should be a philosopher is almost too evident to discuss, as the science he represents is based on natural laws, many of which yet remain to be discovered, and the Weather Bureau of to-day with its remarkable achievements would not be in existence had not thinking men turned into account their knowledge of physics and applied it to the various atmospheric changes, until now the art of observing, forecasting, and tabulating weather conditions follows in importance close on the heels of the science from which it sprung.

It would not seem that philanthropy could enter into an occupation where cold-blooded calculations, facts and figures, play so important a part, but it should be remembered that an observer is at all times ready to brave every climate for the benefit of mankind and science; that his stations are scattered from the edge of the arctic circle in Alaska to the tropical jungles of South America; that he should be equally competent to foretell a change of weather to the weary gold seeker on the Yukon, herald an approaching cold wave from his bleak post in the far Northwest, or recognize the incipient symptoms of a West India hurricane as it coils for a spring at our commerce in southern waters.

Although a printer is furnished to Weather Bureau stations whose publications are printed, yet there will often arise occasions when a knowledge of type setting would greatly increase the value of an observer and prevent many a temporary break in the records of his station.

Statistics play no small part in a weather observer's work, and in order to compile useful data from which to deduce important facts in the future, it is obvious that much depends upon records being intelligently as well as accurately kept. It is a popular belief among some that one day is the exact counterpart of some other; that back in some period of the world's history the atmosphere varied in pressure, the temperature rose and fell, the winds backed and veered and the clouds formed, changed their shape and melted away, each in their turn, with unvarying regularity, again and again, to be repeated in regular cycles as the unceasing mill of time grinds out the years. While many facts tend to prove the fallacy of this theory, climatic records do not yet extend far enough back to positively controvert it, and it rests with the weather observer in the future, with his accumulated data of centuries, to establish the truth.

The relation between climates and crops is so close that a knowledge of the latter is indispensable to the proper performance of an observer's duties, and he should also be geologist enough to study the soil in his State or Territory with a view to determine its special adaptability to the various products. The success of the pioneer, the enjoyment of the tourist, and the recovery of the health seeker depend not only upon the climate of a place but upon its productions as well. The up-to-date farmer is no longer a creature of mere brawn and muscle; he relies as much upon the science of his occupation for success as he does upon the sweat of his brow, and the official who represents the Climate and Crop Service of the Weather Bureau should be alive to all his needs and an unfailing source for any information he may require.

Many of the most important records of the Weather Bureau are now made by self-registering machines which do their work with the aid of electric contacts, and while it is not necessary to be an Edison or a Tesla in order to understand the few principles of electricity involved, an observer should, at least, be master enough of the science of this subtile fluid to account for and remedy any defects in the workings of his instruments.

While a knowledge of astronomy was mentioned as one of the requirements of a weather observer, it must not be supposed that this science is used in connection with meteorology in forecasting the weather, or that an observer should be able to chart the constellations of the heavens, figure out the time for the next transit of Venus, or measure the parallax of Sirius. There are times, however, when a knowledge of some of its elements is imperative, for he should know how to use those imaginary points and circles in the celestial sphere in order to intelligently describe any phenomena that might have a bearing upon his work. There is the aurora to be described in all its details, from the first arch of dawn-like light until it bursts forth in all its variegated splendor; there are halos of endless variety, both of sun and moon, to be noted; there are myriads of meteors that wander from their orbits among the stars and shoot into our atmosphere, leaving a fleeting but luminous track which the quick eye of the observer should measure; and there are many other wonderful things constantly occurring, among and above the clouds, a record of which would make useful data for future investigation.

There have been many marked improvements made in the Weather Bureau during its comparatively short existence; its methods are more scientific, its aims are broader, its results more satisfactory; and, in proportion to its progress, its need for intelligent observers is becoming more urgent. It is the dream of the Chief of the Weather Bureau to some day strike the keynote to absolute accuracy in weather forecasting, and all his subordinates should indulge in the same hope and work for the same conclusion. To this end, no stone that could hide the precious secret should be left unturned, no experiment, however simple, be untried, and no theory be untested.

OBSERVATIONS AT HONOLULU.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, the monthly report of meteorological conditions at Honolulu is now made nearly in accordance with the new form, No. 1040, and the arrangement of the columns, therefore, differs from those previously published.

Meteorological observations at Honolulu.

NOVEMBER, 1898.

The station is at 21° 18′ N., 157° 50′ W.; altitude 50 feet.

Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 10. Two directions of wind, or values of wind force, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours is now given as measured at 1 p. m. Greenwich time on the respective dates.

The rain gauge, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 50 feet above sea level.

Date.	Pressure at sea level.	Temperature. Dry bulb.	Temperature. Wet bulb.	During twenty-four hours preceding 1 p. m. Greenwich time. Temperature. Maximum.	Temperature. Minimum.	Means. Dew-point.	Means. Relative humidity.	Wind. Prevailing direction.	Wind. Maximum force.	Total rainfall.	Average cloudiness.	Sea-level pressures. Maximum.	Sea-level pressures. Minimum.
	*	†	†			‡	‡		§				
1	30.03	74	66.5	80	73	63.7	66	nne.	5	0.04	5	30.10	30.03
2	30.04	74	67	80	74	63.7	65	ne.	6	0.08	4	30.08	29.97
3	29.99	74	67	80	73	63.5	64	nne.	6	0.00	3	30.08	29.98
4	29.98	75	68	80	74	64.7	67	ne.	5	0.00	4	30.04	29.94
5	29.98	74	67	81	74	62.7	63	ne.	6	0.01	5	30.03	29.95
6	29.93	75	68	79	73	63.2	65	nne.	4	0.01	7	30.03	29.91
7	29.93	73	67	78	72	64.5	66	ne.	4	0.01	10	29.98	29.89
8	29.96	73	67	82	71	64.7	65	ne.	3	0.08	4	30.02	29.92
9	29.97	72	68	79	70	64.2	69	nne.	6	0.51	5	30.01	29.92
01	29.94	74	68	80	68	64.0	68	ne.	4	0.10	5	30.01	29.92
11	29.90	70	67	80	71	64.7	70	ne.	3	0.01	5	29.97	29.89
12	29.90	66	65	80	70	64.2	77	nne.	3	0.00	2	29.95	29.85
13	29.91	70	68	80	65	65.7	75	nne.	3	0.21	3	29.95	29.87
14	29.92	74	68	79	69	67.0	76	nne.	3	0.11	6	29.96	29.87
15	29.96	75	70	80	70	67.7	73	ene.	4	0.01	5	29.97	29.88
16	29.97	74	69	78	74	67.5	76	ne.	5	0.06	6	30.02	29.93
17	29.95	74	68	79	71	65.5	69	ne.	4	0.01	4	30.01	29.92
18	29.93	71	67	80	71	64.5	71	ne.	4	0.03	5	29.98	29.90
19	29.91	73	67	79	70	64.0	69	ne.	4	0.01	8	29.96	29.89
20	29.89	72	68	77	71	66.0	75	n-e.	4	0.02	10	29.93	29.87
21	29.91	74	68	81	71	66.0	72	ne.	2	0.01	8	29.94	29.86
22	29.91	72	68	80	72	66.5	67	ne.	3	0.17	7	29.98	29.90
23	29.91	66	65	80	70	65.2	77	ne.	3	0.03	4	29.98	29.89
24	29.89	66	64.5	81	65	64.7	77	ne.	2	0.00	8	29.97	29.86
25	29.93	74	67.5	80	65	65.3	69	nne.	2	0.01	3	29.98	29.89
26	29.97	73	67	81	73	63.5	66	nne.	2	0.00	2	30.02	29.95
27	30.00	74	66	79	72	63.3	65	nne.	4	0.00	2	30.02	29.92
28	30.01	71	67	80	72	63.5	68	ne.	3	0.02	5	30.02	29.93
29	29.97	72	66.5	79	70	64.0	72	ne.	4	0.08	5	30.06	29.94
30	29.89	72	65.5	78	69	62.5	65	ne.	4	0.01	4	30.01	29.92
Sums..	......	......	......	......	......	......	......	......	.....	1.64	.....	......	......
Means.	29.95	......	......	79.7	70.8	64.7	69.6	......	‖	......	¶	30.00	29.91
Departure..	0.00	......	......	+1.1	+1.1	.....	−6.0	......	.....	−4.20	.....	......	.....

Mean temperature for November (6+2+9) ÷ 3 = 74.9°; normal is 73.8°. Mean pressure for November is 29.95; normal is 29.95.

*This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4:30 p. m., Greenwich time. ‡ These values are the means of (2+9+6) ÷ 4. § Beaufort scale. ‖ Mean for the daytime is 3.8. ¶ The mean during daylight is 5.0, whose departure from normal is +0.5.

DECEMBER, 1898.

Date.	Pressure at sea level.	Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Maximum force.	Total rainfall.	Average cloudiness.	Sea-level max.	Sea-level min.
	*	†	†			‡	‡		§				
1	29.91	72	65	80	71	62.3	66	ene.	4	0.00	3	29.95	29.86
2	29.96	72	65.5	79	71	64.0	69	ne.	3	0.02	4	29.99	29.92
3	29,96	73	67	79	71	64.7	71	nne.	3	0.00	6	30.01	29.94
4	29.93	73	67.5	79	72	64.5	69	ne.	2	0.00	6	30.02	29.93
5	29.87	68	64.5	78	72	63.0	72	ne.	3	0.00	10	29.98	29.88
6	29.81	72	69.5	80	66	67.5	85	sw.	1	0.16	4	29.91	29.80
7	29.78	71	69	77	67	69.3	90	wsw.	1	0.56	10	29.86	29.77
8	29.77	64	63	80	69	65.0	85	w.	1	0.02	9	29.84	29.74
9	29.80	66	60	79	63	58.7	68	w-n.	5	0.00	4	29.83	29.71
10	29.92	63	57	74	63	54.3	62	n.	4	0.00	3	29.96	29.86
11	29.93	66	62	78	59	60.0	72	sse.	2	0.00	5	29.98	29.89
12	29.97	64	63	78	62	63.7	80	wsw.	1	0.00	4	29.99	29.88
13	29.97	63	62	78	62	63.7	79	sw.	1	0.00	5	30.04	29.94
14	29.99	73	69	78	61	67.5	79	s.	1	0.13	5	30.01	29.91
15	30.08	70	64	80	69	64.0	79	sw.	3	0.17	4	30.08	30.00
16	30.08	69	60.5	76	67	57.8	63	nne.	5	0.00	2	30.14	30.04
17	29.99	62	60	76	63	59.0	68	nne.	4	0.00	1	30.09	29.99
18	29.96	69	64	76	60	60.3	66	nne.	3	0.00	1	30.05	29.95
19	29.94	67	65.5	77	68	64.3	74	ene.	3	0.01	3	30.01	29.91
20	29.90	64	63	78	64	65.0	80	ene.	3	0.00	5	29.99	29.86
21	29.86	63	62.5	80	63	64.3	85	sw.	2	0.55	6	29.96	29.86
22	29.83	63	62	78	62	62.5	81	w.	2	0.10	5	29.91	29.81
23	29.87	58	56	74	58	64.3	68	nnw.	2	0.00	0	29.91	29.84
24	29.88	67	61	75	57	65.0	61	nnw.	3	0.02	2	29.95	29.85
25	29.86	69	65	74	64	60.0	70	n.	2	0.15	3	29.92	29.85
26	29.91	64	63	76	64	63.3	83	nne.	2	0.13	5	29.92	29.82
27	29.94	63	62	77	62	63.0	81	nne.	1	0.00	1	29.98	29.91
28	29.99	64	63	78	61	64.7	80	e.	1	0.00	5	30.04	29.95
29	29.95	71	63	79	62	62.5	67	ene.	3	0.00	6	30.03	29.95
30	29.92	65	63.5	77	70	63.5	72	ene.	2	0.01	6	30.02	29.94
31	29.94	66	65	79	64	64.5	78	s.	2	0.00	2	29.98	29.88
Sums..	......	......	......	......	......	......	......	......	.....	2.03	.....	......	.....
Means.	29.92	......	......	77.6	64.7	62.5	74.2	......	‖	....	¶	29.98	29.88

Mean temperature for December (6+2+9) ÷ 3 = 70.6°; normal is 71.6°. Mean pressure for December is 29.92; normal is 29.95.

*This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4:30 p. m., Greenwich time. ‡ These values are the means of (2+9+6) ÷ 4. § Beaufort scale. ‖ Mean for the daytime is 2.4. ¶ The mean during daylight is 4.5.

CLIMATE AND CROPS IN NORTH CAROLINA.

By C. F. VON HERRMANN, Section Director.

[NOTE.—The remarks of the Editor of the MONTHLY WEATHER REVIEW for October, 1898, page 470, alluding to the difficulty of locating the especial climatic influence that may have produced a good or a poor crop in any specific year, has suggested to Mr. von Herrmann the following brief study into the general relations between the weather of any season and the resulting crop in North Carolina. The results attained by him show that unseasonably cold weather and hot weather are equally liable to be deleterious. If, then, we add frosts, droughts, floods, and gales, we have at least six purely meteorological obstacles to success, and if we add the insects and the parasitic vegetable growths, we begin to realize the difficulties against which the farmer has to contend. And yet, after all, the plant will perfect its fruit and seed if it is in any way possible. In general, the skilful agriculturist helps the plant in many ways known to him, so that the resulting harvest is largely the result of man's ingenuity and only partially the result of climatic influences.—ED.]

CLIMATE AND CROPS IN NORTH CAROLINA, 1889 TO 1898.

The close of the crop season of 1898 completes a period of ten years during which the complex relationship between climate and the growth of crops has been studied in some detail in North Carolina, and gives opportunity for a brief résumé of the entire decade. Notwithstanding the remarkable variety in the influence exerted by climatic factors and the great difficulty of ascertaining under just what conditions crops flourish best, certain general facts stand forth clearly, and are perhaps worthy of note. It is remarkable, for instance, that the best average crop season experienced in North Carolina was that of the year 1890, following the extraordinarily warm winter of 1889–90; and that the next best season, that of 1894, also followed a relatively mild winter. It is true that the yields of small grains, especially wheat, were poor, and that in 1894 the fruit crop was frost-killed, yet the general excellence of other crops in quantity and quality was marked. In general the past ten years have been characterized by a gradual decrease in the amount of precipitation received up to the middle of the year 1898.

The climatic conditions prevailing during January, February, and March, before the real commencement of growth are important. The favorable conditions are comparatively dry weather, permitting uninterrupted work in the fields, and deficiencies in temperature. It is impossible to separate climatic agencies entirely from the other physical means employed to improve growth; deliberate and thorough preparation of the soil for planting and subsequent active cultivation of the growing crops are the most effective weapons the farmer possesses against adverse climatic influences. Unfortunately he is not always able, however willing he may be, to employ them. The spring of 1895 was in this respect the most unfavorable on account of the very cold, wet weather in spring, which delayed plowing and planting to such an extent that by the end of May crops were from three to four weeks late as compared with an average season. Similar conditions prevailed in the early part of the year 1892. On the other hand, the warm, dry weather of April and May, 1896, permitted such thorough preparation and development that subsequent injurious conditions had a minimum effect.

For good crops it is imperative that March be a cold month. Abnormally warm weather during March forces vegetable growth, and especially the blooming of fruit trees, and great damage invariably results from subsequent killing frosts which always occur in April. This phenomenon has occurred very frequently of late years, especially in 1894, 1897, and 1898. While other seasons have been more favorable in this respect, more or less fruit is always frost-killed in North Carolina in